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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/760,995	01/20/2004	Kuo-Chin Liu	252011-1890	1640

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THOMAS, KAYDEN, HOSTEMEYER & RISLEY LLP
100 GALLERIA PARKWAY
SUITE 1750
ATLANTA, GA 30339

EXAMINER

NGUYEN, THANH T

ART UNIT PAPER NUMBER

2813

DATE MAILED: 08/12/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

10/760,995

Applicant(s)

LIU ET AL.

Examiner

Thanh T. Nguyen

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 09 June 2005.
- 2a) ☒ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-23 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☒ Claim(s) 11-23 is/are allowed.
- 6) ☒ Claim(s) 1-6, 8 and 9 is/are rejected.
- 7) ☒ Claim(s) 7 and 10 is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
- ☐ Certified copies of the priority documents have been received.
 - ☐ Certified copies of the priority documents have been received in Application No. _____.
 - ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|--|---|
| 1) <input type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

Response to Arguments

Applicant's arguments filed on 6/9/05 have been fully considered but they are not persuasive.

Claim Rejections - 35 USC § 102

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

Claims 1-2, 4-5, 8 are stand rejected under 35 U.S.C. 102(e) as being anticipated by Qian et al. (U.S. Patent No. 6,699,399), previously applied.

Referring to figures 1a-3, Qian et al. teaches a semiconductor process for controlling etching profile, comprising the steps of:

providing a plurality of substrates, in which a film to be etched and an overlying masking pattern layer (28) are provided overlying each substrate (see figures 1a+); and

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etching each of the films in sequence in a plasma chamber using the masking pattern layer as an etch mask, a polymer layer being deposited over the inner wall of the plasma chamber during the etching (see figure 3, col. 12, lines 15-67, col. 13, lines 15-67);

wherein an intermediary cleaning process is performed in the plasma chamber between the etchings before the deposited polymer layer reaches such a degree as to induce lateral etching on the next film to be etched (see figure 3).

Regarding to claim 2, the film to be etched is a silicon layer (26, see figure 1a).

Regarding to claim 4, the mask layer is a silicon oxide layer (34, figure 1d).

Regarding to claim 5, intermediary cleaning process is performed between each of the etchings (see figure 3, col. 12, lines 15-67, col. 13, lines 15-67).

Regarding to claim 8, performing a preliminary cleaning process in the plasma chamber before placing the substrates therein (figure 3, col. 12, lines 15-67, col. 13, lines 15-67).

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Claims 3, 6, 9 are stand rejected under 35 U.S.C. 103(a) as being unpatentable over Qian et al. (U.S. Patent No. 6,699,399) as applied to claims 1-2, 4-5, and 8, above, in view of Zhong et al. (U.S. Patent No. 6,127,927), as previously applied.

Qian et al. teaches a method cleaning a semiconductor process for controlling etching profile. However, Qian et al. does not teach the intermediary cleaning process is performed before the deposited polymer layer leads to a spectral intensity associated with the layer to be etched from OES data analysis more than 100 at a wavelength about 405 nm (claim 3), intermediary cleaning process is performed for 1-3 minutes (claim 6), preliminary cleaning process is performed for 8-12 minutes (claim 9).

Zhong et al. teaches a method for control plasma cleaning process by monitoring the optical emission of the plasma wherein cleaning process is performed before the deposited polymer layer leads to a spectral intensity associated with the layer to be etched from OES data analysis more than 100 at a wavelength about 405 nm (see col. 4, lines 6-47, meeting claim 3).

Therefore, it would have been obvious to a person of ordinary skill in the requisite art the time of the invention was made would control plasma cleaning process by monitoring the optical emission of the plasma wherein cleaning process is performed before the deposited polymer layer leads to a spectral intensity associated with the layer to be etched from OES data analysis more than 100 at a wavelength about 405 nm in process of Qian et al. as taught by Zhong et al. because the process would help to identified the endpoint fro the cleaning cycle.

It would have been obvious to a person of ordinary skill in the requisite art at the time of the invention was made to optimize the time range for the cleaning process, since it has been held that where the general conditions of a claim are disclosed in the prior art (i.e.-cleaning

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process), discovering the optimum or workable ranges involves only routine skill in the art. In re Aller, 105 USPQ 233 (CCPA 1955).

The specification contains no disclosure of either the critical nature of the claimed arrangement (i.e.- wherein cleaning process is performed for 1-3 minutes or 8-12 minutes) or any unexpected results arising therefrom. Where patentability is said to be based upon particular chosen limitations or upon another variable recited in a claim, the applicant must show that the chosen limitations are critical. In re Woodruff, 919 F.2d 1575, 1578 (FED. Cir. 1990).

The time range of the cleaning process are considered to involve routine optimization while has been held to be within the level of ordinary skill in the art. As noted in In re Aller, the selection of reaction parameters such as temperature and concentration would have been obvious:

Normally, it is to be expected that a change in temperature, or in concentration, or in both, would be an unpatentable modification. Under some circumstances, however, changes such as these may impart patentability to a process if the particular ranges claimed produce a new and unexpected result which is different in kind and not merely degree from the results of the prior art...such ranges are termed Acritical ranges and the applicant has the burden of proving such criticality.... More particularly, where the general conditions of a claim are disclosed in the prior art, it is not inventive to discover the optimum or workable ranges by routine experimentation.

In re Aller 105 USPQ233, 255 (CCPA 1955). See also In re Waite 77 USPQ 586 (CCPA 1948); In re Scherl 70 USPQ 204 (CCPA 1946); In re Irmscher 66 USPQ 314 (CCPA 1945); In re Norman 66 USPQ 308 (CCPA 1945); In re Swenson 56 USPQ 372 (CCPA 1942); In re Sola 25 USPQ 433 (CCPA 1935); In re Dreyfus 24 USPQ 52 (CCPA 1934).

Therefore, one of ordinary skill in the requisite art at the time the invention was made would have used any time range suitable to the method in process of Qian et al. in order to optimize the process.

Response to Arguments

Applicant's arguments filed 6/9/05 have been fully considered but they are not persuasive.

Applicant contends that Qian et al. does not teach cleaning is to be performed on the chamber surface. In response to applicant, Qian et al. clearly teaches in col. 3, lines 48+, col. 6, lines 24+, cleaning process to be performed in plasma chamber between etching to overcome the problems in the prior art (background, col. 1, lines 10 to col. 3, lines 35), before the deposited polymer layer forms on the sidewalls of the feature (see figure 1b, col. 2, lines 45-67) such a degree as to induce lateral etching on the next film (selectivity between layer (22) and layer (24), i.e. layer (22) etched faster than etching layer (24).

Allowable Subject Matter

Claims 7, 10 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims. because none of the prior art alone or in combination teaches or suggests the particular subset of the process steps intermediary cleaning comprises the steps of: using O₂, Cl₂ and SF₆ as a first cleaning gas for about 30 second, and using Cl₂, and HBr as a second cleaning gas for about 50 seconds.

Claims 11-23 are allowed over the prior art because none of the prior art alone or in combination teaches or suggests the particular subset of the process steps in forming a capping

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layer with a bird's beak overlying the polysilicon layer, and etching each of the polysilicon layers in sequence in a plasma chamber using the overlying capping layer as an etch mask to form a floating gate on each of the floating gate dielectric layers, a polymer layer being deposited over the inner wall of the plasma chamber during the etching, wherein an intermediary cleaning process is performed in the plasma chamber between the etchings before the deposited polymer layer reaches such a degree as to induce lateral etching on the next polysilicon layer.

Conclusion

THIS ACTION IS MADE FINAL. Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Thanh Nguyen whose telephone number is (571) 272-1695, or by Email via address Thanh.Nguyen@uspto.gov. The examiner can normally be reached on

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Monday-Thursday from 6:00AM to 3:30PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Carl Whitehead, Jr., can be reached on (571) 272-1702. The fax phone number for this Group is (703) 872-9306.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the Group receptionist whose telephone number is (703) 308-0956 (See **MPEP 203.08**).

A handwritten signature in black ink, appearing to read 'Thanh', with a stylized flourish at the end.

Thanh Nguyen
Patent Examiner
Patent Examining Group 2800

TTN